

Applicant : Arkady Pittel
Serial No. : 09/991,539
Filed : November 21, 2001
Page : 2 of 10

Attorney's Docket No.: 19965-007001

Amendments to the Claims (this listing replaces all prior versions):

1. (currently amended) Apparatus comprising
a portable electronic device comprising [[,]]
a digital camera ~~associated with the portable electronic device, and~~
~~a processor software configured to run on the portable electronic device and to~~
derive handwriting [[and]] or control information from light received by the digital camera from
a writing instrument separate from the apparatus. ~~hand motion of a writing instrument in the~~
~~vicinity of the digital camera.~~
2. (original) The apparatus of claim 1 in which the portable electronic device
comprises a mobile telephone or a personal digital assistant.
- 3-4. (cancelled)
5. (original) The apparatus of claim 1 also including an infrared filter arranged to
filter light being received from the writing instrument.
6. (original) The apparatus of claim 1 also including a lens arranged to alter the
focal length and/or depth of field of the digital camera.
7. (currently amended) The apparatus of claim 1 also including a mechanism
configured to enable the ~~digital camera~~ portable electronic device to be attached to a writing
surface.
8. (original) The apparatus of claim 7 in which the mechanism comprises a suction
device configured for attachment to a white board.

Applicant : Arkady Pittel
Serial No. : 09/991,539
Filed : November 21, 2001
Page : 3 of 10

Attorney's Docket No.: 19965-007001

9. (original) The apparatus of claim 7 in which the mechanism comprises a clip configured to grasp paper.
10. (currently amended) The apparatus of claim 1 ~~7~~ in which the portable electronic device includes also comprising a writing surface.
11. (original) The apparatus of claim 10 in which the writing surface is on a protective cover.
12. (currently amended) The apparatus of claim 1 in which the processor software is configured to define a mapping between a sensor surface in the digital camera and a space in which the writing instrument is located. ~~hand motion is occurring.~~
13. (currently amended) The apparatus of claim 1 in which the processor software is configured to define the mapping in response to calibration steps that include a user marking three locations in the space in which the writing instrument is located ~~hand motion is occurring.~~
14. (currently amended) The apparatus of claim 1 in which the processor software is configured to derive the location and trajectory of the writing instrument ~~hand motion.~~
15. (currently amended) The apparatus of claim 1 in which the processor software is configured to generate the handwriting and control information based on processing cycles each associated with one location of the writing instrument.
16. (currently amended) The apparatus of claim 1 in which the processor software is configured to discriminate light received from the writing instrument from other light by locking onto a carrier frequency at which light from writing instrument is modulated.

Applicant : Arkady Pinel
Serial No. : 09/991,539
Filed : November 21, 2001
Page : 4 of 10

Attorney's Docket No.: 19965-007001

17. (currently amended) The apparatus of claim 1 in which the processor software is configured to determine a tilt of the writing instrument relative to a direction normal to a writing surface.
18. (currently amended) The apparatus of claim 1 in which the portable electronic device ~~includes~~ also comprises a display, and in which the processor is configured to cause the display to show the trajectory of the writing instrument ~~hand motion is shown on the display in real-time.~~
19. (original) The apparatus of claim 18 in which the display is not touch-sensitive.
20. (currently amended) The apparatus of claim 1 in which the processor comprises portable electronic device includes a digital signal processing chip and a general purpose microprocessor and the software is run in part on the chip and in part on the microprocessor.
21. (currently amended) The apparatus of claim 1 in which the portable electronic device ~~includes~~ also comprises a wireless communication facility and in which the processor software is configured to communicate the handwriting [[and]] or control information to a remote location.
22. (original) The apparatus of claim 1 in which the digital camera is configured to receive light that has been reflected from the writing instrument.
23. (original) The apparatus of claim 1 in which the digital camera comprises a still camera.
24. (currently amended) The apparatus of claim 1 in which the digital camera comprises a video-capable camera.

Applicant : Arkady Pittel
Serial No. : 09/991,539
Filed : November 21, 2001
Page : 5 of 10

Attorney's Docket No.: 19965-007001

25. (original) The apparatus of claim 1 also including an infra-red beacon configured to be directed at the writing instrument.

26. (currently amended) The apparatus of claim 1 in which the processor software is configured to apply pattern recognition to signals from the digital camera.

27 - 41. (cancelled)

42. (new) A method comprising
in a portable electronic device comprising a digital camera and a processor,
receiving images at the digital camera comprising light from a writing instrument
separate from the device, and
deriving handwriting and control information from the images.

43. (new) The method of claim 42 in which the light includes light that originates from light sources on the writing instrument.

44. (new) The method of claim 42 in which the light includes a trace or other marking left by the writing instrument.

45. (new) The method of claim 44 in which the trace or other marking includes ink selected to increase a signal-to-noise ratio of light received by the sensor.

46. (new) The method of claim 42 in which the light includes an image of a tip of the writing instrument.

Applicant : Arkady Pittel
Serial No. : 09/991,539
Filed : November 21, 2001
Page : 6 of 10

Attorney's Docket No.: 19965-007001

47. (new) The method of claim 46 in which the tip of the writing instrument is characterized by being of high contrast with an environment in which it is used.

48. (new) The method of claim 42 also comprising
calibrating the digital camera to permit correctly inferring linear hand motions.

49. (new) The method of claim 42 also comprising
touching the writing instrument to at least two points in turn on a writing surface, and
calculating calibration parameters from images comprising light received from the
writing instrument when it is touching the writing surface.

50. (new) The method of claim 42 also including adjusting a tilt and/or swivel
position of the camera for better coverage of a writing surface.

51. (new) The method of claim 42 also comprising
sequencing light sources on the writing instrument to encode functionality that includes at
least one of erasing or biometrics of handwriting.

52. (new) A method comprising
capturing light from a writing instrument using a two-dimensional sensor in a digital
camera;
calculating a subpixel position of a writing instrument that is in a field of view of the
camera,
calculating lines characterized by subpixel positions of the writing instrument,
applying an algorithm to derive a sequence of motions of the writing instrument from the
calculated lines, and
deriving handwriting and control information from the sequence of positions.